AN ANNOTATED PRELIMINARY CHECKLIST OF THE DICOTYLEDONOUS LIANAS AND VINES FROM THE LAS CRUCES BIOLOGICAL STATION, COSTA RICA

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ABSTRACT

In order to contribute to our understanding of lianas and vines, as well as to facilitate future research, a preliminary checklist of the dicotyledonous lianas and vines from the Las Cruces Biological Station, Costa Rica is presented. Seventy species in sixty genera and thirty-two families are recorded. The largest climbing families at Las Cruces are Cucurbitaceae (11 spp.), Leguminosae (6 spp.), Sapindaceae (5 spp.), and Bignoniaceae (4 spp.).

RESUMEN

Para contribuir al conocimiento de lianas y enredaderas, así como para facilitar otras investigaciones, se presenta una lista preliminar de las lianas y enredaderas dicotiledóneas de la Estación Biológica Las Cruces, Costa Rica. Se citan 70 especies de 60 géneros y 32 familias. Las familias más grandes de Las Cruces son Cucurbitaceae (11 spp.), Leguminosae (6 spp.), Sapindaceae (5 spp.) y Bignoniaceae (4 spp.).

INTRODUCTION

Lianas are important constituents of tropical forests that have, until recently, been largely neglected in both botanical and ecological studies (Gentry 1991). Arguably the most important physiognomic character differentiating tropical and temperate forests (Croat 1978), lianas are woody vines, beginning life as terrestrial seedlings and capable of growth in mature forests (Gentry 1991). Herbaceous vines also start life as terrestrial seedlings, but are typically found in disturbed habitats and lack significant secondary growth. Ninety percent of the liana species of the world occur in the tropics (Walter 1985). Vegetation studies of Central and South American forests indicate that lianas can occur on 42 to 50 percent of forest trees (Montgomery & Sunquist 1978; Putz 1982, 1984). In the last two decades, various lists covering different aspects of the Costa Rican flora have been published (Janzen & Liesner 1980; Hartshorn & Poveda 1983; Haber 1991; Kappelle et al. 1991), how-

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ever, no list has yet been published treating specifically the liana or vine flora of Costa Rica. In order to contribute to our understanding of lianas and vines, and to facilitate future research, the present study sought to document the dicotyledonous lianas and vines of the Las Cruces Biological Station, Costa Rica—a site not previously subjected to systematic liana collections.

METHODS

Site Description

The forest of the Las Cruces Biological Station is classified as tropical premontane rain forest following the Holdridge Life Zone System (Holdridge 1947; Hartshorn 1983). It is a relatively tall forest (30–35 m) with abundant oaks and an epiphyte load conspicuously less than at similarly classified zones at Monteverde (Hartshorn 1983; Krings, pers. obs.). The vegetation of the site is still incompletely known, especially when compared to the more intensively studied La Selva Biological Station. Hartshorn & Poveda (1983) present a preliminary list of sixty-three tree species known from the site.

The climate of the Station is illustrated in Figure 1 by a Walter climate diagram based on data from the Station's meteorological station for the years 1996 and 1997. The mean annual rainfall at the Station is 4236 mm and the mean annual temperature 20.6° C. Stiles et al. (1989) show weather data from the Instituto Meteorológico de Costa Rica indicating mean annual precipitation and mean annual temperature for the nearby town of San Vito to be 3988 mm and 21.7° C respectively.

As seen in Figure 1, rainfall is somewhat seasonal with two distinct peaks from May–June and October–November broken by a '*veranillo*' from July–August. December is the only month in which mean monthly rainfall may drop below 100 mm.

The temperature at the Station fluctuates relatively little throughout the year. As indicated in Figure 1, the highest mean monthly temperature is 21.8° C and the lowest mean monthly temperature 18.7° C. The highest recorded temperature for the two years is 32.4° C and the lowest 15.2° C.

COLLECTION AND DEPOSIT

The dicotyledonous lianas and vines of the Las Cruces Biological Station were collected from August to October 1996 and in March 1997. The collections were made between 1000 m and 1200 m elevation.

Specimens were collected using expandable clipper poles and, in some cases, by climbing the host tree. Sometimes mountaineering ropes were used to assist climbing by attaching them to a weighted fishing line and then shooting the line over a host tree branch with a slingshot (see Perry 1978; Moffett 1993; Laman 1995). The fishing line was used to pull up parachute chord, which unlike fishing line, will support the weight of mountaineer-

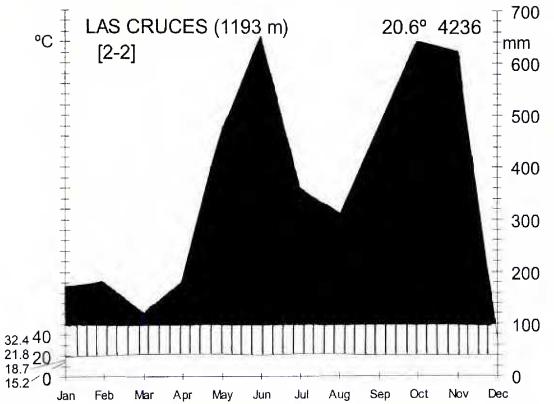

FIG. 1. Climate of the Las Cruces Biological Station, Costa Rica as a Walter climate diagram (based on data from the Station's meteorological station from 1996–1997).

ing rope. Climbing devices, known as ascenders, were then used to climb into the canopy where samples were collected. Voucher specimens were deposited at CR and F.

RESULTS

Seventy species in sixty genera and thirty-two families are recorded. Taxa are arranged alphabetically by family, genus, and species. An asterisk preceding a name indicates that species to be collected from cultivation. Annotations include the relative rarity (Table 1), habit (liana or vine), diameter at breast height (dbh) or height climbed when known, and any distinguishing characteristics. As the relative rarity descriptions are based on casual observation they are not definitive. A complete census of the lianas and vines at

TABLE 1. Relative rarity categories.

Category	Definition
Uncommon	One to five individuals observed
Common	Six or more individuals observed

Las Cruces will most likely change many of these observations. Unless indicated otherwise, notes on distinguishing characteristics come from the author's own study of field and herbarium specimens. For the purposes of the annotations, elevations above 700 m are considered 'montane.'

ACANTHACEAE

Mendoncia brenesii Standl. (*Krings 177*)—Uncommon at Las Cruces. Collection taken from liana climbing to 15 m, 50–60 m from forest edge at an elevation of 1100–1200 m. This opposite-leaved liana is recognized by the subterete, glabrous to strigillose, grooved stems and the ovate bracts. The fruit is bilateral.

Mendoncia tonduzii Turrill (*Krings 213*)—Uncommon at Las Cruces. Collection taken from liana climbing to 11 m at an elevation of 1180–1190 m. Recognized by the 4-angled, hirsute stems and the oblong-elliptic, mucronate bracts, with a rounded apex. The somewhat compressed, purple fruit is asymmetrical near the apex.

AMARANTHACEAE

Chamissoa altissima (Jacq.) Kunth (*Krings 156*)—Uncommon at Las Cruces; only one individual seen. Collection taken from robust liana, 5.7 cm dbh, climbing to 17 m at an elevation of 1120–1200 m. Relatively non-descript, alternate-leaved climber with small flowers subtended by 1–3 bracts in pyramidal terminal inflorescences.

APOCYNACEAE

Mandevilla hirsuta (Rich.) K. Schum. (*Krings 189*)—Uncommon at Las Cruces. Collection taken from vine climbing to only 2 m at an elevation of 1050–1095 m. Distinguished from the other collected Apocynac climber, *Prestonia isthmica*, by the cordate leaf bases and glands on the midrib base above.

Prestonia isthmica Woodson (*Krings 139*)—Uncommon at Las Cruces; only one individual seen. Collection taken at 1015 m elevation, from flexible vine at forest edge with corky, cream-colored older stem and clear, sticky exudate. Young leaves velutinous above and below (see above for other distinguishing characters).

BIGNONIACEAE

Amphilophium pannosum (DC.) Bureau & K. Schum. (*Krings 162*)—Common at Las Cruces. Collection taken from liana 4.3 cm dbh, climbing to 25 m at an elevation of 1075 m. Vegetatively easily recognized by the villous, sharply hexagonal stems with long trichomes (to 2 mm), and trifid tendrils. The compressed, ellipsoid, rugose-tuberculate capsule is also unmistakable. Separated from *Pithecoctenium*, the only other wild Bignon genus in Cosra Rica with hexagonal stems, by the dendroid trichomes of vegetative parts (simple in *Pithecoctenium*).

Arrabidaea verrucosa (Standl.) A.H. Gentry (*Krings 147*)—Common at Las Cruces. Collection taken from liana to 4.4 cm dbh. Distinguished from *A. patellifera* and *A. florida*, the only two other *Arrabidaea* species occurring above 700 m elevation in Costa Rica, by the presence of interpetiolar gland fields, a bilabiate calyx usually greater than 1.5 cm, and a verrucose-tuberculate capsule. Separated from the other tuberculate-fruited Bignon at Las Cruces, *Amphilophium pannosum*, by the linear fruit, to 2.5 cm wide (ellipsoid in *A. pannosum*, to 8 cm wide).

Lundia puberula Pittier (*Krings 258*)—Uncommon at Las Cruces. Collection taken from vine growing over low shrubs at 1075 m elevation. Similar to *Arrabidaea*, but distinguished by the pubescent anthers (glabrous in *Arrabidaea*) and pubescent to velutinous capsules (glabrous, or with scattered trichomes, to tuberculate in *Arrabidaea*).

Martinella obovata (Kunth) Bur. & K. Schum. (*Krings 180*)—Uncommon at Las Cruces; only one individual seen. Collection taken from liana climbing to 15 m, 50–60 m from the forest edge at an elevation of 1100–1200 m. Gentry (1973) suggests good field characters include frequently bending or twisting

petiolules, trifid tendrils, and conspicuous interpetiolar swellings. Unrivaled by any other Bignon in Costa Rica, the narrowly linear fruit (to 1.8 cm wide) can exceed 130 cm in length.

BORAGINACEAE

Tournefortia sp. (*Krings 142*)—Uncommon at Las Cruces. Collection taken from liana climbing into canopy at the forest's edge at 1060 m elevation. Somewhat non-descript, but recognized by the scorpioid inflorescences and wintergreen odor to the crushed leaves.

CAMPANULACEAE

Burmeistera cyclostigmata Donn. Sm. (*Krings 179*)—Common at Las Cruces. Collection taken from vine climbing to 4 m, 50–60 m from the forest edge at 1100–1200 m elevation. Recognized by the milky latex, purplish corolla, and serrate-tipped calyx.

Centropogon granulosus C. Presl (*Krings 172*)—Common at Las Cruces. Collection taken from vine climbing to 3 m at 1050 m elevation. Recognized by the bright red corolla with yellow lobes.

COMBRETACEAE

Combretum laxum Jacq. (*Krings 165*)—Uncommon at Las Cruces. Collection taken from liana climbing into the canopy in closed forest at 1200 m elevation. Recognized by the opposite leaves, parallel, tertiary leaf venation, and distinctive four-winged fruit.

COMPOSITAE

Mikania guaco Bonpl. (*Krings 186*)—Uncommon at Las Cruces. Collection taken from liana climbing to 10 m in closed forest at 1050–1095 m elevation. Recognized by the opposite leaves, three-veined from the base, and the glabrate, fistulose stems.

Mikania skutchii S.F. Blake (*Krings 166*)—Uncommon at Las Cruces. Collection taken from liana climbing into canopy of closed forest at 1200 m elevation. Distinguished from *M. guaco* by the densely villous leaves and the villous, never fistulose stems.

Otopappus verbesinoides Benth. (*Krings 197*)—Common at Las Cruces. Collection taken from liana climbing to only 1.5 m at 1075 m elevation. Characterized by asperous stems and opposite leaves (narrower than in the *Mikania* spp. above or the *Sinclairia* sp. below), three-veined from the base. See Hartman & Stuessy (1983) for a revision of the genus.

Sinclairia polyantha (Klatt) Rydb. (*Krings 187*)—Uncommon at Las Cruces. Collection taken from liana climbing to 7 m at 1050–1095 m elevation. Recognized by the serrate, opposite leaves, three-veined from the base, light green above, and glaucous below.

CONNARACEAE

Rourea sp. (*Krings 203*)—Uncommon at Las Cruces. Collection taken from liana climbing to 7 m at 1170 m elevation. Recognized by cylindrical pulvini, pinnately compound leaves, with the basal leaflets alternate to subopposite, and reflexed branchlets aiding in climbing. *Rourea* has 2 carpels (1 in *Connarus*) and imbricate sepals (valvate in *Cnestidium*) (Woodson et al. 1950).

CONVOLVULACEAE

Maripa sp. (*Krings 277*)—Uncommon at Las Cruces. Collection taken from vine climbing to 17 m at the edge of a forest gap at 1030 m elevation. Recognized by the rounded leaf-bases (cordate in *Merremia*), campanulate, whitish-purple flowers, and often impressed venation. Unlike *Merremia*, the fruit is indehiscent.

Merremia sp. (*Krings 211*)—Uncommon at Las Cruces; only seen in one location. Collection taken from seedlings on forested ridge at 1200 m elevation. Recognized by the distinctive large, rounded-squarish seeds and deeply lobed leaves with typical Convolvulaceous venation. Unlike *Maripa*, the fruit is dehiscent.

CUCURBITACEAE

***Cionoscyos macranthus** (Pittier) C. Jeffrey (*Krings 280*)—Only known from cultivation at Las Cruces. Collection taken from vine near the Station vegetable garden growing at 1095 m elevation. Recognized by the

patelliform glands crowded near the leaf base below and the anthers conduplicate or flexuous. The genus is closely related to *Cayaponia* and essentially only differentiated by the fleshy, peponiform fruit (baccate and fibrous in *Cayaponia*).

***Cucurbita moschata** (Duchesne ex Lam.) Duchesne ex Poir. (*Krings 279*)—Only known from cultivation at Las Cruces. Collection taken from vine growing in Station vegetable garden at 1095 m elevation. Recognized by the 4–5-branched tendrils and somewhat irritating leaf hairs.

Cyclanthera multifoliolata Cogn. (*Krings 269*)—Common at Las Cruces. Collection taken from vigorous vine taking over a large, tree-fall gap at 1190 m elevation. Easily recognized to genus by the anthers in a horizontal ring. Unique among Costa Rican *Cyclanthera* species in the presence of numerous patelliform glands near the leaf base below.

Elateriopsis oerstedii (Cogn.) Pittier (*Krings 175*)—Uncommon at Las Cruces. Collection taken from vine growing outside the Station, on roadside at 1000–1100 m. Easily recognized by the glabrous to puberulous stems, 3-lobate to angulate leaves, whitish-green campanulate flowers with fused filaments and vertically plicate anthers, and smooth, nonechinate, explosively dehiscent fruit.

Fevillea cordifolia L. (*Krings 272*)—Uncommon at Las Cruces; only one individual seen. Collection taken from young liana growing on the edge of a ridge-top gap at 1200 m elevation. One of the few Costa Rican Cucurbits becoming a canopy-reaching liana, it is recognized vegetatively by the bifid tendrils curling above and below the bifurcation. Differentiated from *Sicydium*, the only other montane (i.e., > 700 m) Costa Rican Cucurbits exhibiting tendrils curling above and below the bifurcation, by the woody habit, five stamens, and 3-locular ovary (herbaceous, three stamens, and uni-locular in *Sicydium*).

Gurania makoyana (Lem.) Cogn. (*Krings 276*)—Common at Las Cruces. Collection taken from robust vine climbing to 17 m at the forest edge between 1000 and 1100 m elevation. *Gurania* is one of only two genera recognized by simple tendrils, inflorescences consisting of several flowers, and orange to reddish corollas, but can be distinguished by the orange or reddish calyx lobes (green in *Psiguria*). Separated from other Costa Rican *Gurania* species by the simple leaves, pedicels of staminate flowers 1 to 3 mm long, stem hairs (if present) less than 4 mm long, and the calyx lobes frequently 2 to 3.5 times as long as the calyx tube.

Melothria sp. (*Krings 206*)—Common at Las Cruces. Collection taken from vine climbing to 2 m at 1145 m elevation. Three species of *Melothria* are known from Costa Rica. All are quite similar and cannot be conclusively separated vegetatively. *M. dulcis* is distinguished by a white corolla and yellow to orange fruit. Both *M. scabra* and *M. pendula* exhibit a yellow corolla and are differentiated by the mature fruit (at least 2.5 cm long, light and dark green striped in *M. scabra* versus only to 2 cm long, green to black in *M. pendula*).

Psiguria triphylla (Miq.) C. Jeffrey (*Krings 246*)—Uncommon at Las Cruces. Collection taken from vigorous vine climbing to 15 m at 1000–1100 m elevation. Closely related to *Gurania* (see *G. makoyana* for discussion). Separated from *P. warscewiczii*, the only other *Psiguria* species above 700 m in Costa Rica, by the calyx not green-spotted and the coriaceous leaves (green-spotted calyx and membranaceous leaves in *P. warscewiczii*).

Rytidostylis carthaginensis (Jacq.) Hook. & Arn. (*Krings 250*)—Uncommon at Las Cruces. Collection taken from slender vine growing on a streamside shrub at 1000–1100 m elevation. The only montane Costa Rican Cucurbit displaying an elongate, narrowly cylindrical calyx tube (to 3 cm long).

***Sechium edule** (Jacq.) Sw. (*Krings 278*)—Known only from cultivation at Las Cruces. Collection taken from vine growing in the Station vegetable garden at 1095 m elevation. The genus is recognized by tendrils 3–5-fid and ten floral nectaries at the base of the hypanthium. *S. edule* is recognized by the combination of the nectaries sunken into the base of the hypanthium (but not protruding conspicuously below) and the filaments only partially connate, the anthers free.

Selysia prunifera (Poepp. & Endl.) Cogn.

(*Krings 155*)—Uncommon at Las Cruces. Collection taken from stout liana, 3.2 cm in diameter growing into canopy at 1120–1200 m elevation. The only species of *Selysia* in Costa Rica, it is distinguished from members of *Cayaponia*, *Cionosicys*, *Cyclanthera*, and *Tecunumania*, the only four other Costa Rican genera exhibiting parelliform glands on the abaxial leaf surface, by the glands frequently scattered throughout the abaxial leaf surface (not just crowded near the base), the anthers essentially straight or merely slightly curved at the ends, and the arrow-head shaped seeds.

DICHAPETALACEAE

Dichapetalum nevermannianum Standl. (*Krings 151*)—Uncommon at Las Cruces. Collection taken from liana to 2.5 cm dbh, climbing to 17 m at 1075 m elevation. Distinguished from other Mesoamerican *Dichapetalum* species by the linear-oblong to oblanceolate leaves to only 3 cm wide and the hispid stems and inflorescences (Lundell 1966).

ERICACEAE

Psamissia ramiflora KI. (*Krings 160*)—Uncommon at Las Cruces. Collection taken from shrubby liana climbing to 17 m at 1120–1200 m elevation. The only lianescent representative of Ericaceae observed at Las Cruces, *P. ramiflora* can be recognized by the alternate, plinerved leaves, with swollen petioles.

EUPHORBIACEAE

Dalechampia cissifolia Poeppig (*Krings 245*)—Uncommon at Las Cruces. Collection taken from vine climbing over low shrubs at 1030 m elevation. Recognized by the serrulate, trifoliolate leaves, much resembling *Cissus*, but lacking rendrils. Only two other *Dalechampia* species in Costa Rica are also trifoliolate. *D. websteri* has 6 female sepals and involucral bracts 10–14 mm long and, though also displaying 7–11 female sepals and involucral bract less than 5 mm long, *D. heteromorpha* has simple and trifoliolate leaves intermixed on the stems (Burger & Huft 1995).

Manihot brachyloba Muell. Arg. (*Krings 173*)—Uncommon at Las Cruces. Collection taken from scrambling liana climbing to 6 m trailside at 1060 m elevation. Distinguished from other Costa Rican *Manihot* species by the climbing habit and the tri-lobed leaves (Burger & Huft 1995).

GESNERIACEAE

Capanea sp. (*Krings 214*)—Uncommon at Las Cruces? Collection taken from lianescent plant climbing to 8 m at 1100–1125 m elevation. Characterized by asymmetric, opposite leaves and campanulate corollas with purple spots.

HIPPOCRATEACEAE

Salacia petenensis Lundell (*Krings 182*)—Uncommon at Las Cruces. Collection taken from robust liana to 7.2 cm dbh, climbing to 20 m at 1060 m elevation. The only liana observed at Las Cruces climbing by stout, leafless, curving branchlets (to 1.5 cm diam.). The large spherical fruits are also distinctive.

HYDRANGEACEAE

Hydrangea peruviana Moric. (*Krings 167*)—Common at Las Cruces. Collection taken from liana climbing with adventitious roots into canopy at 1190 m elevation. Recognized by the opposite, serrulate leaves and the brownish stems with parallel ridges.

LEGUMINOSAE

Caesalpinia urophylla (Donn. Sm.) Standl. (*Krings 164*)—Common at Las Cruces. Collection taken from liana to 3.3 cm dbh, climbing to 15 m at 1190 m elevation. *C. urophylla* is heavily armed with thorns and prickles both along the stems and leaves. Also distinguished from other leguminous climbers at Las Cruces by the large, bi-pinnately compound leaves and the spiny, compressed ellipsoid fruit. Seen in more disturbed areas in the forest.

Canavalia oxyphylla Standl. & L.O. Williams (*Krings 191*)—Common at Las Cruces. Collection taken from vine climbing to 10 m at 1015 m elevation. This trifoliolate vine with pinkish flowers is recognized in fruit by an additional suture displaced from the ones on each valve, often appearing medial on the valve.

Machaerium cobanense Donn. Sm. (*Krings 134*)—Common at Las Cruces. Collection taken from liana growing into canopy along trailside at 1015 m elevation. Recognized by the paired spines of stems and the rounded oblong to elliptic leaflets lacking acuminate tips. Stems may exude a red sap when cut.

Machaerium seemannii Benth. ex Seem. (*Krings 193*)—Uncommon at Las Cruces. Collection taken from liana climbing to 6 m at 1030 m elevation. Recognized by the lanceolate leaflets with acuminate tips and the leading shoots often leafless, but armed with paired spines, and curling much like tendrils.

Mucuna sp. (*Krings 135*)—Common at Las Cruces. Collection taken from vine in forest interior at 1015 m elevation. Generally, unmistakable lianas due to the long pendent flowers and fruits, both often with urticaceous hairs.

Rhynchosia erythrinoides Cham. & Schltdl. (*Krings 149*)—Common at Las Cruces. Collection taken from liana with flattened stem climbing to 15 m at 1075 m elevation. Recognized vegetatively by the somewhat rhombic leaflets of the trifoliolate leaf and the flattened stem (no other liana at Las Cruces has been observed with such a stem).

LOGANIACEAE

Strychnos sp. (*Krings 183*)—Common at Las Cruces. Collection taken from liana climbing to 6 m at 1060 m elevation. Easily distinguished from the only other opposite-leaved, tendrillate liana family in Costa Rica, Bignoniaceae, by the simple, often 3-veined leaves. Tendrils in *Strychnos* also tend to be more hook-like.

MALPIGHIACEAE

Hiraea grandifolia Standl. & L.O. Williams (*Krings 148*)—Uncommon at Las Cruces. Collection taken from liana climbing to 20 m at 1075 m elevation. Recognized by densely ferruginously tomentose stems and samaras with semi-circular lateral wings and reduced dorsal wings. Stipules are often borne above the petiole base.

Tetrapterys sp. (*Krings 170*)—Uncommon at Las Cruces. Collection taken from liana climbing to 25 m at 1060 m elevation. Recognized by samaras with four oblong, elongate lateral wings and reduced dorsal wings.

MARCGRAVIACEAE

Marcgravia sp. (*Krings 273*)—Uncommon at Las Cruces. Collection taken from material off the forest floor on a ridge at 1200 m elevation as the high-climbing liana was unreachable. A very distinct adventitious root climber, recognized when young by the often angular stems growing appressed to the trunk of trees with the leaves pressed flat. The somewhat succulent, alternate, frequently dark-punctate leaves, as well as the whorl of flowers harboring a whorl of saccate nectaries in its center, are also unmistakable.

MENISPERMACEAE

Anomospermum reticulatum (Mart.) Eichler (*Krings 184*)—Uncommon at Las Cruces. Collection taken from robust liana to 5.3 cm dbh, climbing to 4 m at 1030 m elevation. Sometimes mistaken as a curiously unifoliolate legume due to the swollen pulvini, *A. reticulatum* is often more readily recognized when dried by the glossy, reticulate leaf venation.

Cissampelos pareira L. (*Krings 194*)—Common at Las Cruces. Collection taken from vine climbing to 4 m at 1030 m elevation. The genus *Cissampelos* in our area is distinguished from other tropical Menisperm genera, such as *Anomospermum*, *Chondrodendron*, *Hyperbaena*, and *Odontocarya*, by the staminate flowers with only 4 sepals (6–18 in the afore mentioned genera) and the herbaceous habit (Rhodes 1962). *C. pareira* is distinguished from *C. tropaeolifolia* in that the leaves are not peltate.

Cissampelos tropaeolifolia DC. (*Krings 268*)—Uncommon at Las Cruces. Collection taken from vine growing over low shrubs on trailside at 1150 m elevation. A more or less weedy vine, *C. tropaeolifolia* is distinguished from *C. pareira* by the peltate leaves and sericeous indument of the leaves.

NYCTAGINACEAE

Pisonia aculeata L. (*Krings 168*)—Uncommon at Las Cruces. Collection taken from stout

liana to 5.2 cm dbh, climbing to 20 m at 1190 m elevation. This opposite-leaved liana is armed with stout, axillary, recurved spines and is recognized in fruit by the stalked glands arranged linearly along the angles of the fruit.

PASSIFLORACEAE

Passiflora costaricensis Killip (*Krings 271*)—Uncommon at Las Cruces. Collection taken from a small liana climbing through trailside thickets at 1170 m elevation. Distinguished from the other two collected *Passiflora* species, by the bilobate leaves, small, subulate stipules, and triangular stems. Distinguished from other bilobate montane *Passiflora* species, by the leaves not peltate, 1 1/2 times as long as wide (or nearly so), and the lateral leaf lobes generally 1/3 the length of the midrib (1/2 or more in *P. capsularis*). The fruit is reddish, ellipsoid, and asymmetrical in cross-section.

Passiflora menispermifolia Kunth (*Krings 150*)—Uncommon at Las Cruces. Collection taken from a small vine climbing to 4 m in the understory at 1075 m elevation. Distinguished from other Costa Rican *Passiflora* species with trilobate leaves by the leaves essentially entire, not peltate, not glandular-ocellate below, villous with straight hairs (puberulent with hooked hairs in *P. lobata*), and petioles with 2 or more gland pairs.

Passiflora oerstedii Mast. (*Krings 215*)—Common at Las Cruces. Collection taken from vine climbing to 4 m in understory between 1100–1125 m elevation. Distinguished from other montane Costa Rican *Passiflora* species with unlobed leaves and cordate leaf bases, by the petioles with 3 or more, linear to filiform, gland pairs, and the stipular venation reticulate (parallel in *P. ligularis*).

PIPERACEAE

Sarcorhachis naranjoana (C. DC.) Trel. (*Krings 144*)—Common at Las Cruces. Collection taken from liana climbing to 6 m at 1060 m elevation. Recognized by alternate, often cordate leaves, swollen nodes, and solitary, axillary, spicate inflorescences (leaf-opposed in *Piper*).

RANUNCULACEAE

Clematis dioica L. (*Krings 195*)—Uncommon at Las Cruces. Collection taken from vine climbing to 5 m at 1030 m elevation. Easily recognized by the opposite, pinnately-compound leaves (3–5 leaflets) and the rachis often curling around objects, much like a tendril, while climbing.

RHAMNACEAE

Gouania sp. (*Krings 138*)—Common at Las Cruces. Collection taken from sterile vine growing in forest edge tangle at 1015 m elevation. Recognized to genus by the tendril axillary to a terminal leaf or inflorescence at apex of short branch and often coiled like a butterfly proboscis. Leaves usually have three basal veins. The collection is probably either *G. polygama* or *G. lupuloides*, the former distinguished by the floral disc somewhat pubescent with relatively long, conspicuous trichomes (glabrous or minutely, appressed puberulent in *G. lupuloides*).

RUBIACEAE

Manettia sp. (*Krings 264*)—Common at Las Cruces. Collection taken from young vine growing over low shrubs in a forest gap at 1070 m elevation. These herbaceous vines are recognized by the opposite leaves with distinct arcuate venation. Corollas are tubular to salverform.

Randia vazquezii Lorence & Dwyer (*Krings 190*)—Uncommon at Las Cruces. Collection taken from liana climbing to 12 m at 1050–1095 m elevation. Recognized by the subterminal, more or less stout, spines in groups of 3 to 4. *Uncaria* spines occur in pairs at the nodes.

SAPINDACEAE

Paullinia alata (Ruiz & Pav.) G. Don (*Krings 140*)—Common at Las Cruces. Collection taken from liana growing into canopy at 1030 m elevation. Distinguished from other pinnately compound-leaved montane *Paullinia* species by the leaves 2-jugate, the leaflets of the lowest pair simple, stipules only to 3 mm

long, the unwinged, red fruit to 2 cm long, and the stem cross-section showing 3–6 peripheral vascular cylinders surrounding a central one.

Paullinia bracteosa Radlk. (*Krings 145*)—Common at Las Cruces. Collection taken from stout liana to 4 cm dbh at 1075 m elevation. Easily distinguished from other pinnately compound-leaved montane *Paullinia* species by the large stipules (2–5 cm long) and the stem cross-section showing a single vascular cylinder.

Paullinia grandifolia Benth. ex Radlk. (*Krings 163*)—Common at Las Cruces. Collection taken from liana climbing into canopy at 1180 m elevation. Distinguished from *P. mallophylla* and *P. ingaefolia*, the only other montane *Paullinia* species with the lowest leaflets of the 3–5 jugate leaves trifoliolate or pinnate, by the unwinged fruit (winged in *P. mallophylla*) and narrowly triangular stipules, to 8 mm long (ovate to broadly lanceolate, 1.5 to 4 cm long in *P. ingaefolia*).

Paullinia pterocarpa Triana & Planch. (*Krings 158*)—Uncommon at Las Cruces. Collection taken from liana to 2.6 cm dbh, climbing into canopy at 1120–1200 m elevation. Distinguished from other winged-fruited montane *Paullinia* species, by the pinnately compound leaves with the lowest leaflet pair simple (all others are either trifoliolate or with the lowest leaflet pair trifoliolate).

Serjania valerii Standl. (*Krings 154*)—Uncommon at Las Cruces. Collected from liana to 3.2 cm dbh, climbing to 15 m into canopy at 1120–1200 m elevation. Distinguished from *S. lobulata*, the only other pinnately 5-foliolate montane *Serjania* species, by the densely hirsute stems and petioles (hairs 1–2 mm long) and the conspicuous stipules, to 5 mm long (inconspicuous, to 3 mm in *S. lobulata*).

SOLANACEAE

Solanum sp. (*Krings 176*)—Uncommon at Las Cruces? Collection taken from liana climbing near forest edge at 1100–1200 m elevation. The genus is recognized by calyces with 5 vascular ribs or lobes and anthers dehiscing by terminal pores (D'Arcy 1973).

ULMACEAE

Celtis iguanaea (Jacq.) Sarg. (*Krings 181*)—Uncommon at Las Cruces. Collection taken from robust liana to 4.3 cm dbh, climbing to 10 m at 1025–1075 m elevation. Although the leaves are somewhat reminiscent of *Gouania* (serrulate to serrate at tip, 3-veined from base), *C. iguanaea* is easily recognized by the lack of tendrils, the presence of spines, the more or less asymmetrical leaf bases, and the asperous leaf surfaces.

VITACEAE

Cissus rhombifolia Vahl (*Krings 192*)—Common at Las Cruces. Collection taken from vine climbing to 3 m at 1060 m elevation. Distinguished from other trifoliolate Costa Rican *Cissus* species by the more or less rhombic terminal leaflet, and the small fruits (ca. 1 cm long and wide).

Cissus verticillata (L.) Nicolson & C.E. Jarvis (*Krings 141*)—Common at Las Cruces. Collection taken from liana growing into canopy at 1030 m elevation. Perhaps the most common of the Costa Rican simple-leaved *Cissus* species, *C. verticillata* is distinguished by the leaves not strongly dimorphic (dimorphic in *C. hiformifolia*), broadly ovate (narrowly elliptic to lanceolate in *C. brevipes*), and the pedicels glabrous (hirtellous in *C. cacuminis*).

Vitis tiliifolia Humb. & Bonpl. ex Roem. & Schult. (*Krings 210*)—Common at Las Cruces. Collection taken from vigorous liana to 7 cm dbh, climbing to 17 m at 1120 m elevation. The only representative of *Vitis* in Costa Rica, *V. tiliifolia* is distinguished from *Cissus* by the 5-merous flowers, the panicle inflorescence, and the leaves densely floccose-tomentose beneath.

DISCUSSION

This list should be treated as a working checklist. Included are only collections that have been assigned with confidence to either genus or species.

A complete collection list, including unknowns, has been deposited at F.

Nine of the eleven tendrillate climbing families of Costa Rica (see Krings 1997), are represented at Las Cruces, although the Leguminosae are represented by only non-tendrillate species. No climbing, tendrillate Polemoniaceae (*Cobaea*) or Polygonaceae (*Antigonon*, introduced) have been found. This is not surprising as *Cobaea* vines are generally found above 1600 m in Costa Rica, well beyond the upper limits of Las Cruces. Only *C. gracilis* and *C. scandens* are known to have been collected as low as 700–1000 m (Krings 1997).

Although incomplete, I hazard that the list includes the majority of the lianescent taxa of Las Cruces. Currently, the largest climbing families are Cucurbitaceae (11 spp., incl. 3 cultivars), Leguminosae (6 spp.), Sapindaceae (5 spp.), and Bignoniaceae (4 spp.)—together comprising 37.1 % of the recorded species. Most additional species records are likely to come from the following, mostly vining families: Asclepiadaceae, Convolvulaceae, Loganiaceae, and Solanaceae. Among monocotyledons, more work is needed for all taxa, but especially *Smilax* L. and *Dioscorea* L., both of which have been seen on the grounds.

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